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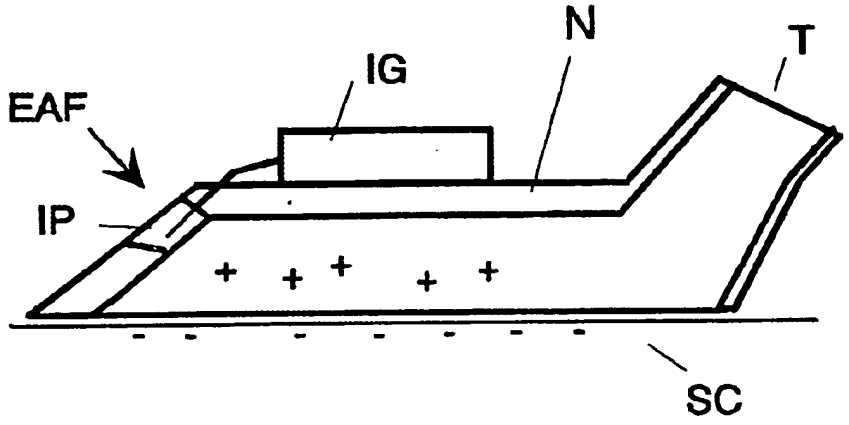

(57) Abstract

The invention relates to a device for cleaning, such as a vacuum cleaner, which includes means for ionization (IG, IP) for ionization of the air flow for cleaning before it contacts with the surface to be cleaned (SC). Furthermore the device may include another means for ionization (IOG) for ionization of air to be exhausted (AF). Furthermore the device may include third means for ionization, for ionization of air to be exhausted with negative ions.

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A DEVICE FOR CLEANING

The invention relates to a device which can be used for cleaning, especially to remove dust. A typical application of this invention for cleaning is a vacuum cleaner.

A vacuum cleaner is frequently used to remove dust. The main parts of a vacuum cleaner and its functions are as follows: a flow of air is produced through the vacuum cleaner, and this flow of air is sucked into a dust bag and suction tubing and also through a nozzle and blown out through an exhaust duct that may have one or more filters for the exhaust air.

It is easy to remove impurities of relatively great size with a vacuum cleaner, but small sized dust particles firstly stick to the surface to be cleaned because of the static electricity and secondly penetrate the filters for the exhaust air.

With the device invented the weaknesses of the present technology can be avoided and characteristics of the invention are expressed in the patent claim 1 and subsequent elements of the patent claims.

The invention can be realized as e.g. a vacuum cleaner, which carefully removes small dust particles and effectively prevents them from escaping from the exhaust air back into the room.

The invention is shown in the enclosed drawings, where

- Fig. 1 shows the invented nozzle used as a conventional nozzle
- Fig. 2 shows the invented nozzle used in accordance with the invention

- Fig. 3 shows a block diagram of the ionization generator in the invented device
- Fig. 4 shows one construction of the central unit of a vacuum cleaner in accordance with the invention
- Fig, 5 shows an outline of the air flow through the air blower, the dust bag and through the filters and means of ionization.

Fig. 1 shows a nozzle (N), e.g. part of a vacuum cleaner. Nozzles of various shapes and sizes are conventional equipment for a vacuum cleaner. The suction tubing (T) of a vacuum cleaner is joined to the nozzle (N) during operation, and air is sucked through the nozzle to clean a surface (SC). Generally T consists of a flexible and a rigid tube part, which can be of telescopic construction. The nozzle (N) directs the air flow from the SC. IG is a means of ionization which generates a high voltage in the ionization electrode (IP) while in use. In Fig.1 is shown a situation, when IP is not used. This situation corresponds to the use of a nozzle according to known technology. When the air flow goes under the nozzle it ionizes the surface SC and the itself . This mechanism is due to the differences in the dielectric constants in the surface and the air. In practice wood, plastic and cloth are charged negatively, while air positively. As dust and surface (SC) are of different material or mixed with air to various degrees, they are charged with charges of different size and the dust will therefore stick tightly to the surface (SC) because of the effect of static electricity. This has been proved in practice: it is extremely difficult to remove fine dust from surfaces with a vacuum cleaner, it needs wiping with a dampened cloth or similar material.

Fig. 2 shows the use of a nozzle in accordance with the invention. Means of ionization (IG) while in operation and

the high voltage it produces will ionize the air with electrodes IP. The ionization of the nozzle occurs in the air flow EAF, which is arranged to occur in a special aperture of the nozzle. Through the effect of the ionization the charges occurring on the surface (SC) are neutralized, and the fine dust is easily carried with the air flow to the tube of the vacuum cleaner. The nozzle can the replaced, just as in known vacuum cleaners. It has been thought that the design of the nozzles could improve the practicability of the device for various spots to be cleaned.

Fig.3 shows a block diagram of the means for ionization: oscillator (OSC) produces an alternative current, which together with the voltage multiplier (VM) generates a voltage of numerous kilovolts. This voltage in turn is conducted through the safety resistors (RP) to the ionization electrode (IP). Resistors (RP) are used to ensure the safety of the user.

Fig. 4 shows one construction of the central unit of a vacuum cleaner in accordance with the invention. The equipment of the motor pump (M) sucks air through the tubing (T) and dust bag (DC) and blows the air (AF) through means of ionization (IGO) for the exhaust air filters (OIF) into the room. The central unit of a so-called central vacuum cleaner is similar, but the IOG and IOF can be left out if the exhaust air need not be cleaned thoroughly.

OIF is for example a means of ionization charging positively, and the exhaust air filter OIF is a filter which has a conducting surface connected to negative voltage. It is a known fact that air saturated with negative ions is healthy, therefore IGO should be equipped with means of ionization, which ionize the AF negatively just before the exhaust air leaves the vacuum cleaner. Electrostatic filtering ensures

the purity of the exhaust air. O1 is a ionization electrode, which is connected with the means of ionization IGO. When the AF goes through the O1 it will become ionized with negative ions.

The air flow (AF) progress through the various filters and means of ionization is shown in Fig. 5. The figure presents also the connection of the high voltage source of the ionizator to different filters and means of ionization and voltages, to which the means are connected.

OIF can include a filter unit produced from thin metal foil, which is produced from scrap metal. As filter material can also be used, e.g. paper containing carbon fibres, plastic with a conducting coating, etc. The filter can be a cassette consisting of a frame and a filter part. The foil in the filter part can be fibrous and loosely packed, to let the air flow fairly smoothly penetrate after contacting a great area. Then the filter is easy and cheap to manufacture and it could be made disposable.
The filter could also be recycled, because it is easy to remove the dust attached.

Above illustrates as typical for the invention that it contains the means IG, IP, which are placed to ionize the air before it gets into contact with surface SC and then neutralizes the static electricity charge which otherwise would have occurred. The ionization can be either positive or negative, or both. A separate route could be arranged for the air to be ionized before it contacts the surface SC.

Furthermore, the device invented can include means IGO intended for cleaning the exhaust air. The IGO ionizes the exhaust air filters OIF opposite the filter surfaces.

Furthermore, the device invented may include means IGO, which also ionize the exhaust air AF negatively just before the air leaves the means OIF, for example into the room.

Furthermore, the means OIF may include a filter unit, which is meant to be disposable. Advantageous is to use thin metal foil made from scrap metal, and the filter unit can be recycled again.

Above is illustrated how the invention can be used in one way. The invention is not restricted to the above, but is can be utilized in many other accomplishments within the limits of the inventive thought as in the enclosed patent claims.

CLAIMS

1. A device for cleaning, such as a vacuum cleaner, including a central unit, a nozzle (N) and a suction tubing (T) c h a r a c t e r i z e d in that it includes means for ionization (IG, IP), and at least part of the flow of air for cleaning is to be sucked through the range of influence of said ionization means before said flow of air is to be contacted with the surface to be cleaned.

2. A cleaning device as set forth in claim 1 c h a r a c t e r i z e d in that at least a part of said means for ionization is placed in the nozzle (N).

3. A cleaning device as set forth in any of the claims above c h a r a c t e r i z e d in that the nozzle may be disconnected from the suction tubing (T).

4. A cleaning device as set forth in any of the claims above c h a r a c t e r i z e d in that it includes another means for ionization (IGO) for ionization of air to be exhausted (AF).

5. A cleaning device as set forth in claim 4 c h a r a c t e r i z e d in that it includes filtering means (OIF) for electrostatic filtering of air to be exhausted (AF).

6. A cleaning device as set forth in claim 4 or 5 c h a r a c t e r i z e d in that it includes additional means for ionization (IGO, OI) for ionization of air to be exhausted with negative ions.

7. A cleaning device as set forth in any of the claims 4 - 6 c h a r a c t e r i z e d in that said filtering means includes a replaceable filtering component (OIF).

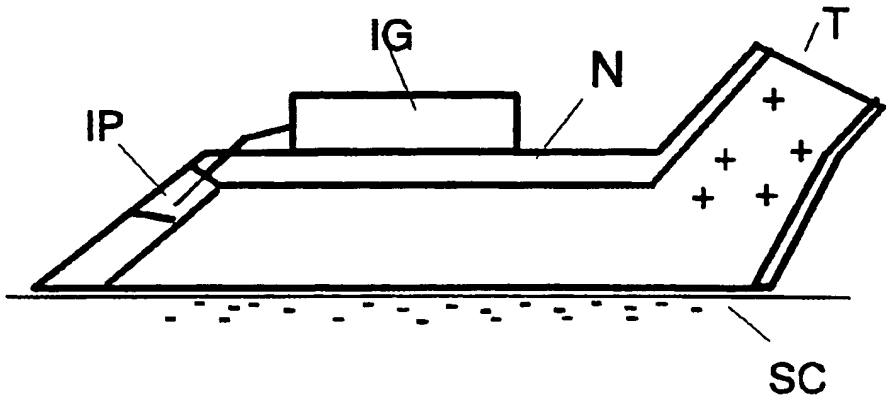

FIG 1

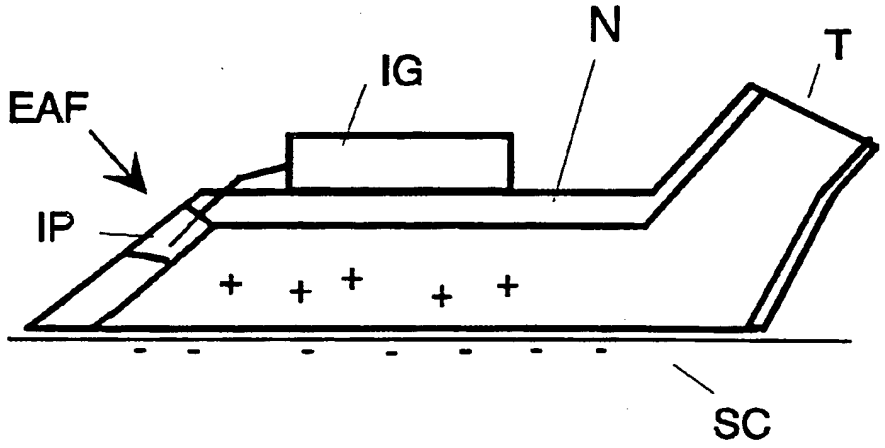

FIG 2

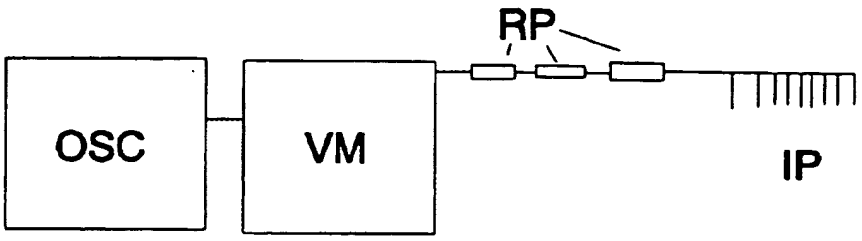

FIG 3

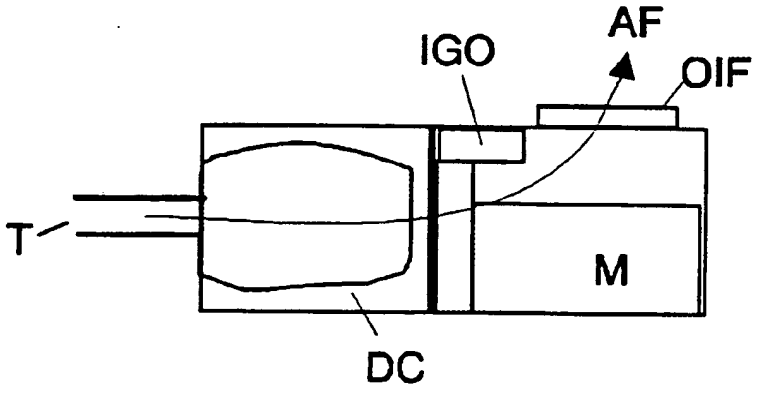

FIG 4

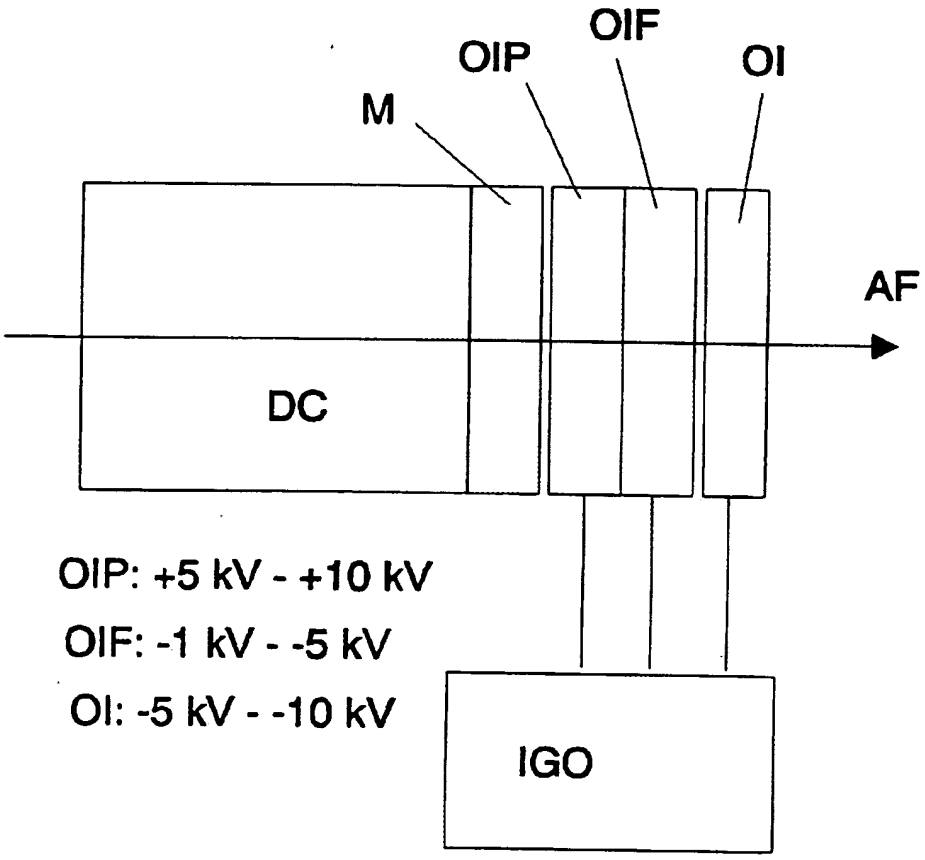

FIG 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 96/00030

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A47L 9/00, B08B 6/00, B03C 3/01
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A47L, B08B, B03C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4751759 A (ZOELL), 21 June 1988 (21.06.88), figure 1, detail 7	1-3
Y	--	4-7
X	DE 3820931 A1 (KIST, PETER), 28 December 1989 (28.12.89), figure 1, detail 3 and 4	1-3
	--	
X	EP 0279109 A1 (SHAPE INC.), 24 August 1988 (24.08.88), figure 4, detail 60	1
	--	
A	FR 2490110 A1 (THOMSON-CSF), 19 March 1982 (19.03.82), figures 1,4, detail 10	1
	--	

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5268009 A (THOMPSON ET AL), 7 December 1993 (07.12.93), figures 4,5,7, abstract --	4-7
Y	EP 0600101 A1 (VOLODINA, ELENA VLADIMIROVNA), 8 June 1994 (08.06.94), figures 1-7, abstract -- --------	4,5

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Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4751759	21/06/88	AU-A- 5660486	05/11/86
		DE-A- 3686223	03/09/92
		EP-A,A,B 0217834	15/04/87
		JP-B- 6002257	12/01/94
		JP-T- 62502804	12/11/87
		WO-A,A- 8605962	23/10/86
DE-A1- 3820931	28/12/89	NONE	
EP-A1- 0279109	24/08/88	JP-A- 63182089	27/07/88
		US-A- 4727614	01/03/88
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